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Morphometric Analysis of Kanger River Basin, Bastar, Chhattisgarh, India

Dr. Swapna Gupta, Dr. P.K. Shrivastava
Faculty, Department of Geology, Govt. Kaktiya PG College, Jagdalpur (C.G.), India, 494001,
Professor, Department of Geology, Govt. V.Y.T. PG Autonomous College Durg (C.G.), India, 491001.

Abstract
A river basin's hydrological behavior, geomorphology, and drainage features can all be quantitatively assessed by morphometric analysis. Using remote sensing and geographic information system (GIS) methods, this research work focuses on the morphometric analysis of the Kanger River Basin, which is situated in Chhattisgarh, India's Bastar district. The lithology, topography, and climate all have an impact on the Kanger River's notable geomorphic diversity as it flows through the forest of the Kanger Valley National Park. To understand the drainage features and hydrological behavior of the basin, a number of morphometric metrics were examined, including stream order, drainage density, bifurcation ratio, and basin relief. The findings show a dendritic drainage pattern, which suggests uniform geological conditions. Nonetheless, the existence of parallel drainage in some areas indicates the impact of slope and extended topography, where streams typically run in a consistent direction because of gradient control. Furthermore, the impact of structural elements like joints, fractures, or faults that direct stream courses at extreme angles is reflected in the presence of angular drainage patterns. These variations are related to the karst terrain of Kanger Valley National Park, where underground channels and fissures created by limestone dissolution affect both surface and subsurface drainage. The study emphasizes the significance of lithology and geomorphic processes in watershed management and conservation planning by highlighting how they shape both karst and fluvial systems.

Keyword: *Morphometric Analysis, Drainage Pattern, GIS, QGIS, Bifurcation Ratio, Watershed Management*

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I. Introduction

A quantitative and analytical examination of the Earth's surface structure, including the size and form of its landforms, is referred to as morphometric characteristics. The local geology, structural components, geomorphology, vegetation, and soils all have an impact on the river's drainage networks and flow pattern. These characteristics are intricate and change throughout time and space. (Suresh & Krishnan, 2022).

Morphometric parameters are useful for analyzing watersheds because they demonstrate the relationships between various catchment factors, such as stream order and length. (Tiwari, 2023). The most popular morphometric parameters are stream order, stream number, stream length, mean stream length, stream length ratio, bifurcation ratio, mean bifurcation ratio, drainage density, drainage texture, stream frequency, relief ratio, form factor, elongation ratio, circularity ratio, and length of overland flow.

Drainage basin/watershed analysis based on morphometric parameters is crucial for watershed planning because it gives information about the basin's topography, slope, soil quality, runoff characteristics, surface water potential, etc. (Sukristiyanti et al., 2018). The following headings have been used to derive the morphometric properties for the entire basin: Areal aspects are two-dimensional, relief aspects are three-dimensional, and linear aspects are one-dimensional. Drainage morphometry is necessary to analyze different hydrological processes in the watershed. Morphometric analysis is used to determine flood susceptibility.

Soil erosion is associated with the linear and relief properties of bifurcation ratio, drainage density, stream frequency, drainage texture, relief, and roughness number. Geographic indices and geomorphic elements, such as longitudinal profile, slope, asymmetry factor, and basin elongation ratio, can be analyzed to gain an understanding of drainage dynamics and landscape changes. Hydro morphometric feature computation, remote sensing, geographic information system (GIS) technology, and catchment terrain analysis are major rivers and asymmetric factors associated with basin side slopes.

Stream networks and the river boundary can be delineated using either contemporary techniques utilizing remote sensing data and GIS technologies or traditional approaches utilizing toposheets and on-site observations. (Gupta, 2024).